

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claim 1 (currently amended): An apparatus for attaching a respective tube segments of a series of tube segments to a bag respective ones of a series of flexible bags by fusing them together to form a series of sterilized flexible packages and filling the series of flexible packages with a product in an aseptic form, fill and seal operation, the series of flexible bags being formed of a web of film and being releasably interconnected to one another, each of the series of flexible bags comprising wall portions defining a hollow interior space and a pair of opposing peripheral edge portions confronting each other to define an interface space in communication with the hollow interior space, each of the tube segments being an elongated member having an opposed pair of ends, a passageway interconnecting the ends and an exterior surface, one of the ends being open and the other of the ends being closed, said apparatus comprising:

a sterile processing chamber adapted to receive the series of a sterilized tube segments and the series of flexible bags to sterilize the series of flexible bags, a pair of opposing wall portions of a bag film to form a flexible bag are to be located, the sterilized tube segment having an open end, the opposing wall portions defining an interior space therebetween;

a tube inserter at least partially located within the said processing chamber and arranged to grip respective ones of the series of sterilized tube segments and place the respective ones of the sterilized tube segments between the opposing sterilized peripheral edge wall portions of respective ones of the flexible bags film in the sterile processing chamber;

and at least one member for fusing the a portion of the exterior surface of each respective one of the sterilized tube segments between the opposing sterilized peripheral edge wall portions of the respective ones of the sterilized flexible bags film so that the open end of the a respective one of the tube segments is in communication with the interior space in the a respective one of the sterilized flexible bags and the closed end of each of a respective one of the sterilized tube segments is located outside of a respective one of the sterilized flexible bags; and means for filling the hollow interior of each of the sterilized flexible packages with the product and then sealing the packages with the product therein.

Claim 2 (original): The apparatus of claim 1, further comprising: a tube sterilization chamber in which tubing from a supply of tubing is introduced, the tube sterilization chamber being in communication with the sterile processing chamber.

Claim 3 (original): The apparatus of claim 2, wherein the tube sterilization chamber includes a hydrogen peroxide bath.

Claim 4 (original): The apparatus of claim 3, further comprising a dryer located downstream of the bath.

Claim 5 (original): The apparatus of claim 4, wherein the dryer comprises a heated sterile air supply.

Claim 6 (original): The apparatus of claim 3, further comprising a plurality of rollers located in the bath, the tubing extending between the rollers to provide a desired dwell time to ensure sterility.

Claim 7 (original): The apparatus of claim 2, wherein the tube sterilization chamber is at least one of a hydrogen peroxide vapor chamber, a hydrogen peroxide bath, an ultraviolet radiation chamber, an ion radiation chamber, or a high intensity pulsed light chamber.

Claim 8 (original): The apparatus of claim 1, further comprising a hydrogen peroxide vapor generator connected to the sterile processing chamber that feeds hydrogen peroxide vapor into the chamber.

Claim 9 (original): The apparatus of claim 8, wherein the hydrogen peroxide vapor is at least at a 31% concentration.

Claim 10 (original): The apparatus of claim 1, further comprising a tube supply unwind stand with a supply of tubing.

Claim 11 (original): The apparatus of claim 10, wherein the unwind stand includes a brake to keep tension on the tubing.

Claim 12 (original): The apparatus of claim 10, wherein the supply of tubing includes pre-crimped, irradiated tubing so that an inside of the tubing is sterile.

Claim 13 (original): The apparatus of claim 10, wherein supply of tubing comprises tubing crimped only at each end, the apparatus further comprising at least one pre-heat section to preheat a portion of the tubing, and a crimper located downstream of the preheater to crimp the tubing into sealed tube segments.

Claim 14 (original): The apparatus of claim 10, further comprising: a cutter located in a sterile area in or in communication with the sterile processing chamber to cut the tube segment from the supply of tubing.

Claim 15 (original): The apparatus of claim 14, wherein the tube cutter comprises opposing blades that are driven together to cut the tubing into tube segments.

Claim 16 (original): The apparatus of claim 15, wherein the opposing blades mounted to at least one rotary actuator, swing toward one another to cut the tubing.

Claim 17 (original): The apparatus of claim 14, wherein the supply of tubing is pre-crimped, and the apparatus further comprises a crimp position sensor in proximity to the tube cutter, the crimp position sensor being adapted to detect a position of the crimp to allow a location of cut to be positioned adjacent to the crimp.

Claim 18 (original): The apparatus of claim 14, wherein the tube cutter is mounted for movement by an actuator to adjust a position of the tube cutter based on a crimp in the tubing.

Claim 19 (original): The apparatus of claim 14, wherein the cutter is pre-heated.

Claim 20 (original): The apparatus of claim 10, further comprising opposing drive wheels to grip and pull the tubing from the supply of tubing.

Claim 21 (original): The apparatus of claim 20, further comprising a dancing bar located in a path of the tubing, the dancing bar is moveable between upper and lower positions, and a sensor connected to the dancing bar which signals the drive wheels to feed additional tubing when the dancing bar approaches the upper position.

Claim 22 (original): The apparatus of claim 10, wherein the inserter comprises opposing jaws that are moveable toward one another to grip an end of tubing from the supply of tubing prior to the tubing being cut from the supply of tubing to form the tube segment.

Claim 23 (original): The apparatus of claim 22, wherein the opposing jaws are moveable toward and away from the bag film.

Claim 24 (original): The apparatus of claim 23, wherein the opposing jaws are moved linearly by linear actuators connected to the jaws to insert the open end of the tube segment between the sides of the bag film.

Claim 25 (currently amended): The apparatus of claim 1, further comprising a ~~bag~~ film splitter that separates the opposing peripheral edge wall portions of ~~the~~

~~bag film~~ from one another at a tube insertion site prior to the inserter placing the tube segment in position.

Claim 26 (currently amended): The apparatus of claim 25, wherein the ~~bag~~ film splitter comprises two arms joined in a V-shaped arrangement that moves from a first position, in which only a first part of the arms at a base of the V are located between the opposing ~~wall peripheral edge~~ portions of ~~the bag film~~ so that the ~~bag~~ ~~wall peripheral edge~~ portions are not separated, to a second position, in which spaced apart ends of the arms are moved between and separate the peripheral edge ~~wall~~ portions to allow insertion of the tube segment therebetween.

Claim 27 (original): The apparatus of claim 1, wherein the at least one member is arranged to provide ultrasonic energy to the open end of the tube located between the wall portions of said bag.

Claim 28 (currently amended): The apparatus of claim 1, wherein the at least one member comprises at least one sealing jaw for heat sealing the open end of the tube segment between the peripheral edge ~~wall~~ portions of ~~the bag film~~.

Claim 29 (original): The apparatus of claim 28, wherein there are two opposed heat sealing jaws which include a recess complementary to and smaller than a diameter of the tube segment.

Claim 30 (original): The apparatus of claim 29, wherein the heat sealing jaws include a fin seal for an edge of the bag.

Claim 31 (currently amended): The apparatus of claim 30, wherein the heat sealing jaws each include a plurality of heating zones that are controlled independently to provide a different heat sealing temperature in an area of a seal between the ~~bag~~ wall portions to form a ~~bag~~ the edge seam than an area of a seal between the peripheral edge ~~bag~~ wall portions and the tube segment.

Claim 32 (currently amended): The apparatus of claim 31, wherein the heat sealing jaws are heated to 350-450.degree. F. for heat sealing the peripheral edge ~~bag~~ wall portions to the tube segment, and from 250-350.degree. F. for heat sealing the ~~bag~~ wall portions together to form the ~~bag~~ edge seam.

Claim 33 (currently amended): The apparatus of claim 29, wherein the heat sealing jaws are moveable from a first, non-contact position, away from the walls of the bag film, to a second, sealing position, in contact with the walls of the bag film, to seal the tube segment between the peripheral edge ~~wall~~ portions of ~~the bag film~~.

Claim 34 (original): The apparatus of claim 29, wherein the heat sealing jaws include a tube sealing recess with a flattened profile having a circumference that is smaller than a circumference of the tube segment.

Claim 35 (original): The apparatus of claim 29, further comprising a controller to control a tube cut position, a tube feed rate, a temperature of heat sealing jaws and a sealing time.

Claim 36 (original): The apparatus of claim 1, wherein tubing from a tubing supply is introduced into the sterile processing chamber, the apparatus further

comprising a pressure sensor to determine if a sterile environment in the sterile processing chamber is breached, and a tubing crimper which crimps the tubing upon the pressure sensor detecting a loss of pressurization to maintain sterility of the tube supply.

Claim 37 (withdrawn): A flexible bag with a directly connected dispensing tube connected under aseptic conditions, comprising: a polymeric bag formed of a polymeric film having two wall portions overlying one another and connected together via a fold which forms a common connected, non-seamed edge, and a plurality of other common peripheral edges which are fused together to form edge seams, the wall portions, the edge seams and the non-seamed edge defining an interior space of the bag; and a sterile tube segment having an open end, inserted between the two wall portions of the film along one of the common peripheral edges and secured thereto by a fused joint created under aseptic conditions, the open end of the tube being in communication with the interior space, the tube having a closed end, located outside of the film.

Claim 38 (withdrawn): The bag of claim 37, wherein a food product is placed in the bag prior to heat sealing a final one of the common peripheral edges.

Claim 39 (withdrawn): The bag of claim 37, wherein the tube segment is an irradiated thermoplastic elastomer.

Claim 40 (withdrawn): The bag of claim 37, wherein the tube segment is formed from polypropylene.

Claim 41 (withdrawn): The bag of claim 37, wherein the tube segment is irradiated with at least 30 kGy to improve bonding to the film.

Claim 42 (withdrawn): The bag of claim 37, wherein the tube segment comprises a blend of polyethylene and polypropylene.

Claim 43 (withdrawn): The bag of claim 37, wherein the tube segment comprises KRAYTON.

Claim 44 (withdrawn): The bag of claim 37, wherein the bag film comprises at least one of EVOH, Olefin, LDPE, LLDPE, ULDPE and PET.

Claim 45 (withdrawn): The bag of claim 37, wherein the bag film is multilayer, and includes a layer of at least one of EVOH, Olefin, LDPE, LDPE, ULDPE and PET.

Claim 46 (withdrawn): The bag of claim 37, wherein the edge seams and the fused joint are heat fused.

Claim 47 (currently amended): A method of attaching respective tube segments of a series of tube segments to respective ones of a series of flexible bags by fusing them together to form a series of sterilized flexible packages and filling the series of flexible packages with a product a tube to a bag by fusion during manufacture in an aseptic form, fill and seal operation, comprising:

providing a web of film having two wall portions for forming a bag with an interior space defining a series of flexible bags releasably interconnected to one another, each of the series of flexible bags comprising wall portions defining a

hollow interior space and a pair of opposing peripheral edge portions confronting each other to define an interface space in communication with the hollow interior space;

sterilizing the series of flexible bags within a processing chamber;
providing a series of sterile sterilized tube segments in the processing chamber, each of the sterilized tube segments having an exterior surface, an open end and a closed end;

inserting respective ones of the open ends of the sterilized tube segments between the opposing sterilized peripheral edge wall portions of respective ones of the flexible bags in the processing chamber; and

fusing a portion of the exterior surface of each respective one of the sterilized tube segments between the opposing sterilized peripheral edge portions of respective ones of the sterilized flexible bags so that a respective one of to the film with the open end of the tube segments is in communication with the interior space in a respective one of the sterilized flexible bags and the closed end of each of a respective one of the sterilized tube segments is located outside of a respective one of the sterilized flexible bags; and

filling the hollow interior of each of the sterilized flexible packages with the product and then sealing the packages with the product therein.

Claim 48 (currently amended): The method of claim 47, further comprising: feeding tubing through a sterilizing area into a sterile environment; and cutting the

respective ones tube segments from a free end of the tubing to form said series of sterilized tube segments.

Claim 49 (original): The method of claim 48, further comprising: sterilizing an outside of the tubing in a hydrogen peroxide bath; and drying the tubing with a dryer located downstream of the bath.

Claim 50 (original): The method of claim 49, further comprising: feeding the tubing through a plurality of rollers located in the bath to provide a desired dwell time to ensure sterility.

Claim 51 (original): The method of claim 48, further comprising: feeding hydrogen peroxide vapor into the sterilizing area to sterilize an outside of the tubing.

Claim 52 (original): The method of claim 48, further comprising: sterilizing an outside of the tubing using at least one of a hydrogen peroxide vapor chamber, a hydrogen peroxide bath, an ultraviolet radiation chamber, an ion radiation chamber, or a high intensity pulsed light chamber.

Claim 53 (original): The method of claim 48, further comprising: unwinding the tubing from a roll on an unwind stand; and applying tension to the tubing.

Claim 54 (original): The method of claim 48, further comprising: supplying the tubing with a plurality of evenly spaced apart crimps, such that the tubing includes a plurality of sealed, sterile inner segments.

Claim 55 (original): The method of claim 48, further comprising: providing the tubing crimped only at each end and having a single sterile inner volume; preheating a portion of the tubing; and crimping an end segment of the tubing to form a separate, sealed tube segment.

Claim 56 (original): The method of claim 48, further comprising: preheating the cutter for cutting the tube segment.

Claim 57 (original): The method of claim 48, further comprising: supplying the tubing with a plurality of evenly spaced apart crimps, such that the tubing includes a plurality of sealed, sterile inner segments; sensing a position of a crimp for the last tubing segment; adjusting a location of the cut so that the tubing is cut adjacent to the crimp.

Claim 58 (original): The method of claim 48, further comprising: gripping and pulling the tubing from a tube supply using opposing drive wheels; sensing an amount of slack tubing using a dancing bar located along a path of the tubing; and feeding additional tubing when the dancing bar approaches an upper position.

Claim 59 (currently amended): The method of claim 48, wherein the method produces a plurality of bags flexible packages in sequence, the method further comprising: gripping a free end of the tubing with opposing gripper jaws prior to cutting the tube segment to be inserted into a next bag from the tubing, ~~the tube segment to be inserted into a next bag being produced.~~

Claim 60 (original): The method of claim 59, further comprising: linearly moving the opposing jaws with the tube segment toward the film.

Claim 61 (currently amended): The method of claim 47, further comprising: separating the opposing sterilized peripheral edge wall portions in an insertion area prior to insertion of the a respective one of the tube segments therein.

Claim 62 (original): The method of claim 47, wherein the fusing takes place by heat sealing.

Claim 63 (original): The method of claim 62, wherein the step of heat sealing includes: providing heat sealing jaws with a recess complementary to and smaller than a diameter of the tube segment; pre-heating the heat sealing jaws; and moving the heat sealing jaws into contact with the film from opposing sides with the tube segment located in a complementary position to the recess.

Claim 64 (currently amended): The method of claim 63, further comprising: forming a fin seal for an edge of the bag with the heat sealing jaws simultaneously with heat sealing the tube segment between the opposing sterilized peripheral edge portions bag sides.

Claim 65 (currently amended): The method of claim 63, further comprising: moving the heat sealing jaws from a first, non-contact position, away from the film, to a second, sealing position in contact with the film to seal the tube segment between the opposing sterilized peripheral edge portions sides of the bag; and

moving the heat sealing jaws back to the first position to allow the bag to index forward to a next station.

Claim 66 (currently amended): The method of claim 47, further comprising: filling the ~~bag~~ flexible package with a viscous or semi-viscous product prior to sealing a final one of the edges.

Claim 67 (canceled).